

Abstract in preparation for submittal to the

**1997 Annual Meeting of the
American Crystallographic Association**

St. Louis, Missouri

July 19-25, 1997

Transient x-ray diffraction used to diagnose high pressure shocked solids* - D. H. Kalantar, R. C. Cauble, E. Chandler, J. Colvin, R. Lee, B. A. Remington, L. Wiley, *Lawrence Livermore National Laboratory*, A. Hauer, *Los Alamos National Laboratory*, J. S. Wark, *University of Oxford*, N. C. Woolsey, *University of Belfast*, M. Meyers, *University of California - San Diego*, G. Ravichandran, *California Institute of Technology*.

As a part of a broader initiative to measure the hydrodynamic behavior of materials both in the solid and liquid state at pressures >3 Mbar, we are developing transient x-ray diffraction diagnostics on the Nova laser. We are studying silicon, copper, and molybdenum packages that are shock compressed with a sequence of shocks using an x-ray drive generated in a radiation cavity. Time-resolved x-ray diffraction is used as a way of verifying that the sample remains solid during the shock compression. We irradiate a backlighter foil to generate the x-rays for the diffraction measurement, and we record the diffraction signal from the shock compressed material with an x-ray streak camera. Time resolution of the diffraction signal allows us to measure the shock compression as the series of shocks pass through the material. We will present results of experiments using silicon crystals to develop the dynamic diffraction technique on Nova. Here we show a 1D compression of $>10\%$ by diffraction from the (111) crystal plane parallel to the surface of the foil. We are developing the ability to measure 3-D compression by simultaneous Laue diffraction from an orthogonal lattice plane, and we are working to develop the diffraction technique to characterize the shock compression of copper foils. Results of this work will be also presented.

* This work was performed under the auspices of the U.S. Department of Energy by the Lawrence Livermore National Laboratory under Contract No. W-7405-ENG-48.